descendants of the New Netherlanders had become Dutch Americans, a people easily distinguishable from their counterparts in the Netherlands. Their divergence from the paths of their ancestors was only hastened by the American Revolution. But in the new republic of the United States of America, there could be found a variety of Dutch-American identities and some still seemed very Dutch. Firth Fabend's discovery of the persistence of a theologically-based Dutch identity among the Reformed Dutch laity in the nineteenth century makes clear that the history of New Netherland, at least in some quarters, extended well into the nineteenth century.62


Digging Tunnels, Building an Identity: Sandhogs In New York City, 1874-1906

By JAMES MORTON TURNER

A compound of circumstances peculiar to the needs and technologies of the era raised a particular group of common laborers to a place of distinction in the public view. James Turner is a graduate student in the History of Science Program at Princeton University.

One evening in March 1907, police in lower Manhattan came running to Sherry's restaurant on Fifth Avenue, summoned by complaints of rowdy noise. Inside, a celebration was in full swing. The contractors building the second pair of Hudson River tunnels were honoring the engineers and laborers who had taken a hand in the work. After a fancy dinner and cigars, entertainment followed. The “Sandhog Band,” dressed in the working garb of the tunnels—yellow oilskin suits, long rubber boots, and yellow tunneling hats—took the stage. They made the noise that brought police running. The sandhogs’ musical instruments were not fashioned from standard brass. Instead, they chose their instruments to reflect the panoply of sounds important to their work. The tuba was rigged to make a bubbling sound akin to compressed air blowing out in an underwater tunnel. The tin cornet sounded like a tired fog siren. And the bass horn's voice approached that of a tunnel explosion.¹

“Sandhogs” enjoyed recognition around New York City. Three newspapers covered their celebration at Sherry's that night. This recognition was unusual for laborers in turn-of-the-century New

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The commerce of the city depended on common labor: men to load bricks for bricklayers, clean-up on construction sites, and dig tunnels for subways. Common laborers made possible the great engineering feats that underpinned the rising metropolis. In most countries, these men had names: navvies in Britain, terrasiens in France, Streckenarbeiter in Germany. In America, however, with few exceptions, there were no popular names for laborers. If they did receive any attention, it was usually the generic, reform-minded criticism of progressivists and temperance ideologues directed at immigrants. The exception was the “sandhog.”

Sandhogs built the underwater tunnels that began to link Manhattan with its surrounding boroughs and New Jersey at the turn of the century. This dangerous work distinguished the sandhogs from other laborers. As these tunnels were built, the sandhogs were always at the head of the tunnel, where the tunnel-tube was being carved out of the riverbed. Their work area was highly pressurized to keep water from flooding the tunnel-works. An airlock isolated the sandhogs, separating them temporally and spatially from other workers. By the time other laborers reached a segment of the tunnel, the sandhogs were already ahead, pushing the tunnel forward. Sandhogs working in these tunnels faced many dangers. Their pressurized work areas were the least stable places in the tunnel, and a case of the “bends” could strike the men as they left the compressed air. In the summer of 1906, frequent blow-outs and problems with the bends spurred newspaper articles and a coroner’s investigation, which focused public attention on these men and helped define the public identity of the “sandhog.”

Two years before, in 1904, “sandhogs” did not exist. Even though men performed the exact same work under the same conditions, these laborers were unknown to society at large. They were simply “compressed-air workers,” engaged in a line of work nearly forty years old. The identity that “sandhogs” enjoyed at Sherry’s in 1907 was a cultural construct. A construct that was recognized by the newspapers and by New York City, and one also embraced by the workers who celebrated themselves as part of the “Sandhog Band.”

The formation of the “sandhog” identity began forty years before they were recognized in 1906. To understand why sandhogs emerged in New York City when they did requires considering forty years of tunneling technology and medical history, urban-immigrant life, urban demography, and labor politics. Sandhogs emerged from the confluence of many historical currents. In considering them all, the world of the compressed-air laborer emerges alongside their working-class identity. Thus, this labor history departs from those which focus primarily on unions, strikes, and politics. This history seeks to understand other influences underlying these social constructions. To understand the labor of compressed-air workers, this paper turns to the forces shaping their public identity, and how this public identity facilitated their work.

Fundamental to the emergence of the “sandhog” in 1906 was the changing role of New York’s waterways at the turn of the century. Until the end of the nineteenth century, the New York Harbor was critical to the development of the city. The harbor was the outlet of an extensive inland waterway system that linked the port of New York to the Great Lakes, Lake Champlain, and the St. Lawrence River. The expanse of farms, forests, mines, and markets made accessible to barges through this network of rivers and canals facilitated New York’s domination of American shipping during the nineteenth century.

The rise of the railroad and population growth, however, changed New York’s relationship to its broad waterfront. Despite the railroads’ importance to the commercial life of New York, rail lines did not reach the principal passenger terminals or shipping docks in lower Manhattan. All lines, except those of the New York Central, stopped on the Hudson’s western bank—one mile from Manhattan. Extensive ferry terminals and freight docks lined the New Jersey banks where the lines ended. On any given day, a ceaseless traffic of ferries, lighters, and barges plied the short distance from Jersey City to the east bank of the Hudson; each craft ferrying railroad passengers and goods between the continental railroads’ termini and the port’s primary operations in Manhattan. Before the railroad, the river had served as a vital artery in the city’s commercial links with the continent. Now the Hudson had become a rift in the economic fabric of the port. It caused wide-spread ineff-
iciency in a port handling thousands of railroad passengers a day and forty percent of the nation's shipping.3

The city's population grew in lockstep with its commerce. By 1900, two million people populated Manhattan. In some quarters of the borough, the population even exceeded 300,000 people per square mile. For city planners and residents alike, neighboring boroughs and New Jersey offered the promise of residential expansion for the over-crowded island. Population densities in these neighboring regions, across the Hudson and East Rivers, were one-quarter that of Manhattan. But commuting to Manhattan required waiting for ferries to cross the harbor. By 1906, these ferries already shuttled over 200,000 commuters each day. On foggy mornings, or when ice blocked the river, this traffic stopped altogether—paralyzing the port. Forward-looking planners only anticipated increases in this traffic as the metropolis's growth continued to outpace its urban infrastructure.4

With the metropolis spilling over into these neighboring regions, incorporating them in the daily dynamics of New York life, the harbor quickly became an obstacle to continuing growth. The waterways kept railroads out of lower Manhattan and slowed workers' daily commutes. Politicians foresaw that these physical obstacles to the city's growth could only be overcome by a politically united metropolis. A decade-long consolidation movement culminated in the formation of Greater New York in 1898. Consolidation advocates argued New York's future could not be realized as a region of five independent boroughs. Rather, the expanding metropolis's problems demanded the coordinated planning touted by late nineteenth-century Progressives. Early construction of the Interborough Rapid Transit (IRT) subway in 1900 represented a first step towards this goal. But the harbor's waterways, and the slow ferries, remained a major obstacle to metropolitan travel. At first, schemes for surmounting the harbor focused on bridges. New York had already celebrated the technical achievement and graceful geometry of the Brooklyn Bridge in 1883.5 Construction of a second bridge across the East River, the Williamsburg, began in 1896. Gilded Age America measured progress by the yardstick of technological achievement and any structure linking Manhattan to the continent would have been glorified as an eighth wonder of the world. But engineering challenges and high costs plagued any plans for a bridge across the Hudson. If not bridged over, then some engineering prophets proposed tunneling under the Hudson. By the early twentieth century, New York City had plans for a network of underwater tunnels linking Manhattan to New Jersey and its neighboring boroughs. For the city, the tunnels promised quick transit around the metropolis. For compressed-air workers, these new tunnels promised years of steady work beneath the river.

Underwater tunnels appealed to turn-of-the-century New York engineers for practical, engineering, and economic reasons. Underwater routes avoided entirely the vexing problem of obstructing busy port traffic with bridges. Directing trains down into tunnels was also much easier than routing trains up onto river-wide bridges. Estimates even suggested tunnels were the more economical of the two options. Only one problem remained: no one had ever successfully completed a subaqueous train tunnel under the

New York harbor. It was not for lack of trying. One entrepreneur, Dewitt Clinton Haskin, started the first tunnel under the Hudson in 1874. Nearly fifty men died in the tunnel before he abandoned it in 1882.

Haskin's work marked the first attempt at large-scale underwater tunneling in New York City. For the next thirty years, tunneling technology would be advanced underneath the harbor as different engineers took up Haskin's original project three more times before finally completing it in 1904. These tunneling efforts also began to create job opportunities for laborers who would one day be recognized as “sandhogs.” Though they were simply common laborers in 1874, the conditions under which they worked changed alongside the developments in underwater tunneling technology. The history of this technology, and the issues that defined tunneling between 1874 and 1906, are critical to understanding the boom in tunneling in New York City in the early twentieth century and the consolidation of the “sandhog” identity in the summer of 1906.

When Haskin began his project in 1874, he knew little more about tunneling than did the laborers who worked for him. Haskin, a former Army colonel and a small-scale railroad businessman, originally got the idea for the tunnel on his way to New York from California in the 1870s. His journey included a fortuitous stop in St. Louis, where he observed engineers sinking pylons for the first trans-Mississippi bridge. The engineers employed a novel construction technique. Large iron boxes, called “caissons,” filled with compressed air excluded water from the works, allowing engineers to excavate the Mississippi river-bottom and secure foundations ninety feet beneath the riverbed. Upon arriving in New York, Haskin soon made plans to apply this same concept sideways, digging a tunnel beneath the Hudson the same way that foundations were dug in the Mississippi.

Compressed-air works in tunneling were not unprecedented. An inventive French engineer, Marc Brunel, pioneered compressed-air tunneling under London's River Thames in 1827. Accidents dogged Brunel’s works, but the Thames Tunnel opened in 1843. And compressed air had been used on the East River: engineer John Roebling used it twice to gain footholds for the Brooklyn Bridge in the late 1860s. The completion of Roebling's work freed laborers who were experienced in compressed-air work, but all were as new to tunneling as Haskin. With some of these men on hand, Haskin made plans to use compressed air to keep the sand, silt, and mud of the Hudson from collapsing his tunnel as laborers worked beneath the riverbed. If the air pressure in the tunnel could

Sandhogs in New York City

Evidence for the movement of laborers can only be inferred from the coincidental timing of the two jobs and the number of workers who claimed long experience on compressed-air jobs. For a summary of Haskin's early plan, refer to S. Burt, Tunnelling Under the Hudson River (New York, 1885), 13-20.

Haskin's plan for constructing the first Hudson tunnel did not fully anticipate the geology of the Hudson riverbed. The condition of the bed under the Hudson was entirely different from what Brunel had encountered under the Thames. Brunel's 1840s Thames tunnel bore primarily through packed London clay. Emergencies arose in his work only when occasional semi-fluid pockets of sand threatened to allow water to flood his works. In comparison, tunneling beneath the Hudson involved operating in a dangerous riverbed of semi-fluid silt. Silt is a dark slate color, and forms a dense, tenacious mass when moist. The silt—resulting from the accumulation of dirt and other detritus from the Hudson River watershed—can be compared to the wet sand of a coastal tidal pool. As a hole is dug into it, the hole collapses in on itself, the silt losing its form and securing each section with support before it had a chance to collapse.\(^9\)

Legal problems held up Haskin's project for five years, and construction did not begin in earnest until 1879, but within a year three shifts of laborers were working around the clock tunneling out under the Hudson. At the start of each shift, twenty-eight men entered an airlock separating the work-site from the tunnel heading. Inside, the air pressure slowly increased to match the air pressure of the tunnel. Pressurizing the airlock was a noisy process taking ten to fifteen minutes. The roar of air stifled conversation and workers had to repeatedly swallow in order to equalize the pressure on their ear drums. Increased pressure also warmed the air: airlock temperatures of 95 to 100 degrees were common. When the pressure in the airlock reached 15 pounds per square inch, or one atmosphere above normal, the tip of the tongue and the lips began to feel numb. Soon thereafter, the pressure reached that of the tunnel (up to 40 psi), and the door separating the tunnel and airlock opened, allowing workers to enter the tunnel.\(^10\)

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10. Seward Erdman, "Aeropathy or compressed air illness among tunnel workers," Journal of the American Medical Association 49 (1907), 1665. All pressures are in pounds per square inch (psi) and are given as the pressure exceeding standard air pressure of approximately 15 psi.
and oozing like wet sand back into the excavation. In the same way that the Hudson funneled capital into New York over the previous centuries, it had been funneling silt into the harbor for thousands of years before. At the turn of the century, as much as 250 feet of this silt blanketed the bottom of New York harbor.11

When working in semi-fluid silt, the compressed-air workers had to be constantly aware of the integrity of the tunnel. The tunnel can be imagined as an air-filled soda bottle underwater. If a hole develops in the bottle, water will stream in as the air inside escapes. Likewise, in an underwater tunnel, if the whine of escaping air could be heard, workers immediately rushed to the spot in the tunnel wall and plugged the leak with mud. If they did not, a blow-out could flood the works. When 250 feet of the Hudson River tunnel had been constructed, one of these weak spots developed in the tunnel’s main chamber. Only eight men of twenty-eight survived. One survivor described the beginnings of the trouble:

We dropped our work, all grabbed handfuls of the mud and ran to the leak, which was on the north side of the chamber. As soon as we reached it we began to plaster the mud over the hole . . . and as fast as we put a patch of mud over it the tremendous force of the air shot it upward as if it was going out of a gun . . . it was no use.12

When it was apparent the leak could not be stopped, the night foreman called for the men to save themselves. As they scrambled into the airlock, the hole gave way, allowing mud and water to pour in from the river above as the compressed air in the tunnel rushed out. The eight men who survived made it into the airlock before the tunnel was flooded.13

This first major accident in New York underwater tunneling shaped the tasks of compressed-air workers for the next thirty years. Engineers had been criticizing Haskin and his tunneling method before he ever began. In a letter to the New York Times, one engineer wrote, “As no engineer’s advice has been followed in any part of the work, it cannot be called an engineering work, and neither the profession of civil engineering, nor any member of it, should be blamed for the blunders which have been made.”14 Contractors on tunnel projects typically attempted to blame the laborers for accidents, rather than the technology or working conditions. On the day of the accident, Haskin’s superintendent explained to the Times that if the laborers had kept a “strict watch” for leaks,

13. Ibid.

Another view of the lengthy effort to reach the bodies of workers killed in the collapse of July, 1880. From Frank Leslie’s Illustrated Weekly, August 7, 1880.
"I am confident the disaster never would have occurred." Thirty years later, the same accusatory rhetoric would mark contractors' attitudes toward immigrant deaths on the Pennsylvania Railroad tunnels beneath the East River.

As in the years to come, the accident also initiated a strike. In September, while excavation of the flooded tunnel continued, the laborers demanded better pay on account of the dangerous working conditions. In this case, the laborers "considered $3 a day about the proper compensation for the work they were expected to do, but they [did] not demand as much as that." Haskin did not meet their demands, and when they continued the strike, he ordered them paid off and released. Compressed-air workers performed risky, but essentially unskilled labor for an hourly wage. Haskin knew they could easily be replaced; New York was well populated with recent immigrants eager to work seven hours for $1.50 in pay. New immigrants hampered attempted tunnel strikes time after time: their willingness to work in the place of strikers compromised the compressed-air workers' bargaining power.

Even though one man died for every twelve feet of Haskin's completed tunnel, and criticism of the plans persisted, Haskin managed to restart work within six months. The tunnel continued to suffer minor blow-outs, but none fatal. Soon, a new fear, more subtle than the blow-outs, began to trouble the compressed-air workers. As the tunnel dipped further beneath the river, the air pressure increased to meet the greater weight of the riverbed above. With the increased pressure, the laborers began to develop a mysterious set of physical ailments upon leaving the compressed air at the shift's end. One worker described the sensation as if "a heavy load on your chest... disappears all of a sudden, but instantly you feel a sharp pain in your legs or arms as the case may be and your bones feel as if they were pricked with a million needles." The ailment already had a name in the 1880s: "caisson disease." The medical condition had been a problem on the celebrated St. Louis and Brooklyn bridges, where caissons were used to sink foundations into the riverbeds. On Haskin's tunnel, as work progressed, twelve of fifty workers died from the ailment. Because of these problems with caisson disease, blow-outs, and fires, Haskin failed to secure financing to continue his project in 1882. When his funds ran out the Hudson River tunnels were still four-thousand feet short of Manhattan.

Nothing defined the work of compressed-air workers more than caisson disease. Going to work in "air" meant risking trouble with the dangerous ailment. It was frightening. Caisson disease struck men without warning. In Haskin's tunnel, each man must have walked away from work wondering if he would soon feel the first twinges of an attack. But the attacks were unpredictable: one day a worker was fine, the next he could be stricken with painful paralysis in the legs, arms, or whole body upon leaving work. Many times men would recover in a few hours, sometimes after a few days, but scores would die from the disease. An expert understanding of caisson disease, like that of tunneling technology, was critical in shaping the work environment that would underpin the "sandhog" identity in the twentieth century. The transformation of compressed-air laborers into sandhogs began in the 1860s, when American doctors first attempted to explain the disease. The doctors' theories were wide ranging, and involved many qualitative factors such as facial hair, diet, body build, living conditions, and resting habits. Tunnel contractors took these suggestions seriously, and attempted to apply them to tunnel work. In doing so, they helped distinguish compressed-air workers from other laborers on tunnel jobs. To understand what defined the "sandhog" in the twentieth century, it is important to look back at medical understandings of caisson disease in the nineteenth century.

Though laborers on Haskin's tunnels suffered severely from caisson disease, the ailment first posed a problem in America on the foundation work for the St. Louis River Bridge and the Brooklyn Bridge. In the 1860s, when these structures were built, little was known of the disease. On the Mississippi foundations, for instance, workers thought it could be warded off by the use of galvanic bands or armor. Initially, the superintendent, foremen, and contractors, would mark contractors' attitudes toward immigrant deaths on the Pennsylvania Railroad tunnels beneath the East River.

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men all agreed that the armor provided remarkable immunity. The engineers even distributed the supposed protection at company expense. "The bands were made of alternate scales of zinc and silver, and were worn around the wrists, arms, ankles, waist, and also under the soles of the feet." But men continued to die. Armor could not stop caisson disease.

The ailment came to be an accepted risk in compressed-air work. Laborers hobbling to jobs, crooked with pain, were said to resemble women dressed in the style of the day—the Grecian bend. Women wearing this costume walked with their shoulders thrown forward and their posteriors emphasized with stuffed bustles. One former supervisor in St. Louis wrote that "[o]ur workmen, those who were well, when they saw one of their comrades coming up with the described symptoms of caisson disease, would laughingly exclaim: 'He has got the Grecian Bend!'" With sad familiarity, workers shortened caisson disease to simply "the bends."

Both the St. Louis and Brooklyn bridges retained doctors to study, treat, and prevent the curious condition. These practitioners were schooled in anatomy and palliative treatments for medical disorders. Scientific study of medical conditions did not distinguish their work. Modern medical sciences, such as physiology, were just being pioneered in Europe and such fundamentals as the germ theory of disease transmission and antisepsis were not even accepted in America before the 1870s. Within this context, disagreement characterized American understandings of caisson disease. Dr. Antoine Jaminet and Dr. Andrew Smith, the two leading American doctors studying the ailment, each offered distinct hypotheses for its cause. Their differences reflected the unconstrained and speculative nature of nineteenth-century medical thought. Without established investigative tools or methods, practitioners called upon varied ideas to reconcile the mysteries of the disease. The differences in these early theories are important. The stock of superstition they engendered persisted into the early twentieth century, creating a distinct framework for what became the working environment of the "sandhog."

When laborers descended into the Mississippi River caissons in the late 1860s, the resident physician, Doctor Jaminet, went with them, taking pulse rates, observing the color of their skin, and questioning them about their condition. Nothing about the caissons impressed Jaminet more than the extreme temperature differences the men experienced leaving the compressed air. He himself had made the trip many times, and he always commented on being cold, exhausted, and winded when he left the compressed air. Based on these observations, Jaminet suggested caisson disease arose from temperature change and exhaustion. He believed when workers left the compressed air of the caisson too quickly, the rapid transition shocked the body. Either the change in pressure or the decrease in air temperature could prompt a reflex action. He described it as the "spontaneous refrigeration of the whole system, but principally of all the abdominal organs." This reflex action caused caisson disease. As preventative measures, Jaminet offered a number of recommendations. All laborers should wear flannel shirts and belts (wrapped twice around the body), beard and whiskers, and wool socks with tall boots to protect against temperature drops. The clothing should always be kept dry and warm. Three meals a day composed primarily of meat and sufficient rest, particularly when leaving the caisson, warded off exhaustion. While Jaminet focused on heat and exhaustion, he did recognize the rate at which workers entered and left the compressed air as important in causing the disease. To avoid the disease, he therefore recommended raising the air pressure 3 pounds per minute when workers entered the tunnel, and decreasing it twice as fast when they left.

Twelve years later, Andrew H. Smith, the Brooklyn Bridge doctor, dismissed Jaminet's theory of exhaustion and offered an alternate, highly mechanistic theory of caisson disease's causes. Smith believed that in compressed air, "vascular tension" decreased as
increasing air pressure forced blood into the body’s central cavi­
ties near the brain and spinal cord. “The blood [was] distributed
not in accordance with the physiological demands of the different
parts, but in obedience to overpowering physical force.” Upon leav­
ing the caisson, Smith suggested blood circulation would be slow
due to the decreased vascular tension. As a result, the parts of the
circulatory system congested by the force of compressed air, such
as the brain and spinal cord, could not empty the excess blood.
Without circulation, these vital organs lost “nutrition” and the bends
soon followed.

To assess an individual’s risk of getting caisson disease, Smith
appealed to the momentum formula. Just as the “momentum of a
moving body is found by multiplying the weight by the velocity,
so the danger in these cases is as the degree of pressure to which
the person has been exposed, multiplied by the duration of expo­
sure.” While his explanation may have been shaped by Newtonian
mechanics, Smith’s focus on the degree of pressure and the dura­
tion of exposure was useful. It helped him realize that the most
critical transition for the compressed-air worker occurred when
leaving the caisson. “[I]t is altogether probable that if sufficient
time were allowed for passing through the lock the disease would
never occur.”22 Smith recommended five minutes for the passage.
If the disease struck after this transition, Smith suggested return­
ning the laborer to compressed air.

Despite this largely mechanistic approach to caisson disease,
Smith did consider some qualitative factors. He entertained the
possibility that the hazards of the city could complicate the condi­
tion. In the caissons, carbon produced by the burning of lanterns
clouded the air. Smith thought it possible that this hazard, com­
pounded by the overcrowded and poorly ventilated boarding-houses
where the laborers slept, could make the men especially suscep­
tible to caisson disease. Smith offered a solution: any large com­
pressed-air projects in the future should incorporate plans for ad­
quate housing and feeding of the men convenient to the worksite.
Similar to a company town, Smith envisioned temporary barracks

22. Andrew H. Smith, The Effects of High Atmospheric Pressure, Including the Cais­
on Disease (Brooklyn, 1873), 32–35, 36. His emphasis.

where the men spent their off-hour duties, and which they left only
with proper precaution.23

Despite the range of causes suggested by these practitioners,
both recognized the amount of time that laborers spent in leaving
the caisson as an important factor in the disease.24 Unlike Jaminet,
Smith recognized the transition as preeminent. In Europe, physi­
ologists had begun offering new explanations for caisson disease
based upon gas laws and physiology. American doctors however,
dismissed this research as unlikely. American medicine was not
ready to embrace European physiology in the 1870s. Not until the
early twentieth century, when compressed-air workers were suf­
ferring severely in the New York tunnel works, would the physi­
ological explanation of the disease gain currency. Thus, caisson
disease remained a baffling ailment. And in the nineteenth cen­
tury, Jaminet’s and Smith’s idiosyncratic ideas for preventing the
disease would create a distinct work environment for compressed­
air workers, helping to distinguish them as “sandhogs” in the early

Even for those willing to risk blow-outs and mysterious health
hazards, compressed-air workers could find no work from 1882
until 1889. For seven years, the two thousand feet of Dewitt
Haskin’s tunnels sat abandoned, reaching only a third of the dis­
tance to Manhattan. Financial difficulties had plagued Haskin’s
work since its inception. He incorporated the Hudson River Tun­
nel Company in 1873 to fund the construction. But in 1882, with
$2,000,000 expended and finances at rock-bottom, Haskin tried to
sell out to the Pennsylvania Railroad. Neither the railroad nor any
other American interest would support him: the project seemed
too risky. In 1888, a British firm arrived to inspect Haskin’s in­
complete tunnels. Sir Benjamin Baker and his backers had recently
financed a successful tunnel under the Thames. In late 1888, the
same British firm offered Haskin $5,000,000 in capital to restart
his works.25 Haskin accepted. The British offer included more than

23. Ibid., 51.
24. Jaminet, Physical Effects of Compressed Air, 116; Smith, The Effects of High Atmo­
spheric Pressure, 53; Woodward, A History of the St. Louis Bridge, 262.
just money, it also included technical expertise and medical innovations that helped push the Hudson tunnels nearly to Manhattan.

The British did two things that changed the work of compressed-air workers in New York forever. To speed the work and make it safer, S. Pearson & Co., a construction company already famous for British bridges and tunnels, erected a tunneling device, called a shield, in the tunnel headings. The device was a half-century old, but Sir James Henry Greathead had recently perfected it during the construction of the 1880 London Tower Subway. The device resembled an empty soup can, twenty feet in diameter, with a lid on its front end. Compressed-air still stabilized the tunnel as before, but this giant soup can provided protection to the laborers who worked inside it to move the tunnel forward. Large hydraulic jacks attached the rear of the shield to the completed tunnel. These jacks thrust the shield forward into the soft silt. As the jacks pushed the shield forward, two things happened. First, open doors in the front end of the shield allowed the silt ahead of the tunnel to pour into the shield. Laborers removed this excavated silt from the tunnel. Second, as the jacks pushed the shield forward, a gap opened between the finished tunnel and the forward-moving shield. When this gap was three feet wide, compressed-air workers stopped the jacks and installed iron to support this new section of tunnel. Next, the jacks were reattached to this newly built segment of the tunnel, and the shield was thrust forward again. With each advance, the tunnel moved three feet closer to Manhattan.

Installing these remarkable British shields in the old tunnel headings was dangerous work. It required raising the air pressure to unprecedented levels, and as chief-engineer E. W. Moir recalled, "the men suffered severely." In 1890, Moir introduced the first above-ground air chamber for treating caisson disease by reimmersion. While it may seem counter-intuitive, workers in compressed air who suffered "a little bend" when they left the air at lunch-time, noticed that when they reentered for the second shift, the pain disappeared. Dr. Andrew Smith had commented on this paradox twenty years before and had even outlined plans for an above-ground lock to simulate its mitigative effects. "Let there be constructed, of iron of sufficient thickness, a tube nine feet long and three and one-half feet in diameter," with a window and a bed. This apparatus was to be attached to the compressed-air lines that supplied the tunnel. When a man suffered from the bends, doctors returned him to this chamber and increased the pressure to match the tunnel. Then, the pressure could be reduced slowly until it reached normal. In this way, the pain could be relieved, and caisson disease treated. Doctors called the device a "medical air lock." With the introduction of the Greathead Shield and the invention of the medical airlock, swift progress marked the British works in


27. Andrew H. Smith in J.L. Corning, "Observations on the caisson or tunnel disease, with notes on nine cases which occurred at the engineering works known as the Hudson Tunnel," Medical Record 37 (1890), 520-21. Smith never implemented this life-saving device during construction of the Brooklyn Bridge.
New York. In just over a year, from mid-1890 to late-1891, the tunnels doubled in length, progressing another 2,000 feet. While construction was not entirely safe, articles in the New York Times indicate that accidents and caisson disease were significantly reduced. But construction stopped again. The financial crises that depressed the world economy in the mid-1890s had already beset England by 1892. Without sufficient funds, S. Pearson & Co. had to abandon the tunnels. At the turn of the century, however, only finances, not safety or technology, separated New York from the mainland.

Amidst the hoopla of the 1898 consolidation of Greater New York, the city’s debut as the second largest in the world, and the expanding economy of the early twentieth century, an aspiring young man from Georgia struck on the not-so-novel idea of tunneling directly from Manhattan to New Jersey. When William G. McAdoo broached his idea to a local lawyer, he learned of the existing, yet uncompleted tunnels. In October 1901, McAdoo entered the Hudson tunnels with Charles Jacobs, a successful British engineer who had used British compressed-air technology, a few years earlier, to construct a small gas tunnel under the East River. When Jacobs pronounced the tunnels and shields mechanically sound, McAdoo contacted the tunnels’ bond-holders and acquired rights to the works. The Hudson River tunnels suited his ambition. Ultimately, he served the country as its first Director General of Railroads, Secretary of the Treasury, and as a U.S. Senator from California. But in 1901, McAdoo’s plans centered on tunneling from New York to New Jersey. Construction resumed in 1902 with Jacobs as chief engineer and McAdoo as president of the New York and New Jersey Company.

Construction progressed rapidly. Using the existing shield, laborers finished excavating the final 1,500 feet that separated the tunnel from the New York heading. Despite an unexpected reef of rock that required novel tunneling techniques, the laborers “holed through” the Hudson River tunnel in March, 1904. Hours later McAdoo became the first man to walk on land directly from New York to New Jersey. An observer in Scientific American wrote, when "Mr. W. G. McAdoo resolved to take hold of the uncompleted tunnel and push it through to the Manhattan side, public interest in the scheme was altogether dead. . . ."

With the completion of the Hudson River tunnel, McAdoo had ushered in a century of underwater tunneling in New York City. With one train tunnel under the New York harbor complete, a score of others were readied for construction. McAdoo’s own company expanded plans to include a system of underground and underwater railways directed at placing “the great terminal stations of the railroads, in Jersey City, in direct railroad communication with the

various business centers on Manhattan. In the same month that McAdoo completed his tunnel, the Pennsylvania Railroad began work on Penn Station and its attendant tunnels. And on the East River, the IRT made plans for tunnels to connect the new subway lines on Manhattan directly with those in Queens and Brooklyn. In fact, nine tunnel headings would spay out beneath Manhattan like so many life-lines within the next three years.

For the compressed-air workers, the new tunnel headings around the New York harbor held the promise of steady work. Until the start of the twentieth century, compressed-air work in New York, and elsewhere, had been sporadic: on the foundations of the Brooklyn Bridge, occasional work on the Hudson tunnels, and on the East River gas line. Temporary work on skycraper foundations, using the same techniques as on the Brooklyn Bridge, helped fill in down time between large jobs. It is doubtful that any man served on all of these projects, especially considering the high death rates, but there is evidence that some men did work many of these jobs. Of the ten cases of caisson disease reported in the medical literature from an early East River tunnel, five men had eight to fourteen years experience in compressed air. These men must have moved from one compressed-air job to the next over the years, probably encountering the same men on different jobs. This continuity suggests that some men sought out compressed-air jobs, and identified themselves with the work. In 1906, when the public recognized the “sandhog,” the identity was not constructed entirely by outside observers. Early bonds among compressed-air workers also contributed to the identity. The origin of these bonds is explained by the distinct working environment on compressed-air projects.

If the worker found friendship and loyalty on the work-site, the

amenities of the “sand-house,” the team work in the tunnel heading, and the constant threat of caisson disease and blow-outs must have engendered a distinct camaraderie among many compressed-air workers. Strong ties among the workers frequently come to light in the newspaper articles reporting tunnel disasters. Filial relationships are occasionally mentioned, but even more compelling is evidence that the workers shared housing. On Haskin’s project, one New Jersey boarding house lost six residents in the 1880 accident. In following years, other residences lost two and three men to single accidents. The daily routine of the compressed-air worker contributed to the creation of this bond. Upon arriving on the job-site, a compressed-air worker reported first to the changing room. Dr. Smith’s ideas for temporary barracks and Dr. Jaminet’s emphasis on resting quarters, from the first river bridges, were institutionalized in what workers called the “sand-house.” All compressed-air laborers stopped here, at the top of the elevator leading to the below-ground tunnel entrance, to prepare for work. One reporter described these facilities as “large and light and . . . scrupulously clean.” Dr. Jaminet’s belief in dry, warm clothes as a precaution against the bends was provided for. Each man had a locker with a perforated floor above a steam pipe. While the men worked in the tunnel, “the current of warm, dry air rising through the lockers soon dried out wet clothes and insure[d] that the men will have warm, dry clothing when they come out.” Entering the tunnel the men wore heavy rubber boots, slickers, and other protective clothes, as Dr. Jaminet recommended. Each gang of compressed-air workers typically included thirty men. To prepare for work, they all gathered simultaneously in the sand-house and just before their shift, rode an elevator down to the tunnel. If the tunnel was advanced out under the river, they rode a service train through the completed tunnel, passing any other laborers performing finishing duties, until they reached the airlock. Here they crowded into a lock thirty feet long and six feet in diameter, and sat together for ten to twenty

31. Ibid.
32. Foundation work has always provided short-term employment for compressed-air workers. These jobs were not as large or dangerous as the tunnel projects, and little information about them has survived. See Andrew H. Smith, “Cases of Caisson Disease,” in Medical and Surgical Reports of the Presbyterian Hospital in the City of New York (New York, 1896), 28.
minutes while the lock-tender carefully raised the air pressure to match the air pressure of the tunnel. When the lock-tender signaled, the door opened, and the men fled into the tunnel as a single working-unit.35

Doctors prescribed the length of time that the men worked. Even though Dr. Jaminet and Dr. Smith offered very different ideas of what caused caisson disease, both doctors believed the time spent working should be closely regulated. Based on his theory of exhaustion, Jaminet offered a precise schedule for the St. Louis workers. Smith followed with a similar scale based on his momentum formula for compressed air. At the turn of the century, other doctors recommended that when air pressure exceeded thirty-two pounds, the men work three hours, rest three hours, and return for a final three hour shift. During the breaks the men retired to the sand-house where they could nap, eat, or entertain themselves. And at the day’s end, the sand-house usually included facilities for bathing and showering with hot and cold water.36

As a result of compressed-air tunneling technology and nineteenth-century medical beliefs, the sandhogs were spatially and temporally separated from all other laborers on the tunnel-site. Dr. Jaminet and Dr. Smith’s early medical theories helped create the sand-house, which separated compressed-air laborers from other laborers before and after work, and in the tunnel the airlock isolated the pressurized work area at the leading edge of the tunnel where the compressed-air workers toiled. Considering this organization of the tunnel work-site and the dangers the compressed-air workers faced, it is easy to see the beginnings of the common bonds that would distinguish these common laborers as “sandhogs” in the summer of 1906.

These early bonds among the laborers were first formalized in 1892 by the newly created Compressed Air Workers Union, which was probably founded by the men who returned consistently to each new compressed-air job. The union’s early history is sketchy. The first efforts at unionization probably followed strikes for higher wages when the men suffered severely from caisson disease. Such strikes took place on every compressed-air project in the nineteenth century, but they were uncoordinated and largely unsuccessful because immigrants could readily be obtained to replace the laborers. When S. Pearson & Co. abandoned the Hudson River tunnels in late 1891, his compressed-air workers probably went to the East River to work for Jacobs in 1892, but problems with labor occurred there too. The union was formed that same year.37

These early efforts at unionization indicate that by 1900 many compressed-air workers distinguished themselves from other laborers. Though strikes for higher wages certainly motivated many compressed-air workers to unionize, it is likely that the intimate nature of the compressed-air workers’ daily routines and working environment would have encouraged these men to group together. The union intended to include all men who worked in compressed air, but not all of these men joined the union. The diversity of the tunnel work-force probably hindered unionization. As one reporter commented, “The men speak tongues as divergent as those employed by the builders of the Tower of Babel” and this “operates to keep the men from getting together.”38

It is likely that the union men spoke English. One superintendent on the old Hudson River tunnels recommended ethnic diversity as the secret to work-force harmony. He said, “Men hailing from the same country and speaking only the one language are almost sure to hatch some scheme that may be troublesome. They will discuss wrongs, imaginary or real, and easily magnify these to an alarming degree.”39 When men spoke a variety of languages, he continued, this almost never happened. Boosters in Massachusetts once advertised their town’s diverse working-class as an ad-

37. The union’s full name changed over the years. In this paper I will refer to it as the Compressed Air Workers Union. The founding year is on the cover of United Compressed Air and Foundation Workers of America, Constitution and By-laws of United Compressed Air and Foundation Workers of America, Amalgamated August 1, 1900, Pamphlets in American history. (Bowery, N.Y., 1900).
vantage to industry; it helped keep strikes down. The strategy did impede tunnel unionization. While the Compressed Air Workers Union existed in the 1900s, the union did not command much recognition from construction companies or the newspapers.

Ethnicity slowed unionization, but it did not undermine working relations in the tunnels. Compared to most early twentieth-century common labor groups, which were frequently stratified by an ethnic hierarchy, compressed-air workers appear to be an exception. As one might expect, diversity characterized the men. Nationalities in the airlock closely tracked immigration demographics. When Haskin started his tunnel in the 1880s, most of the laborers were Irish, German, or Swedish. By the 1900s, most were African American, Italian, or Slavic. Lists of injured men after accidents provide a snapshot of work-gang composition. Instead of ethnically segregated gangs—one for Italians, another for Slavs—the compressed-air gangs were mixed. Complaints about new workers, or “green” men, were common, but the comments of sandhogs quoted in many newspapers in the summer of 1906 suggest that general criticism based on race and ethnicity was surprisingly rare. While it is difficult to know if ethnicity determined responsibilities within gangs, on at least one tunnel an African American occupied the preeminent job of lock-tender.

Compressed-air laborers occupied a difficult middle ground between skilled and unskilled work. Unlike most unionized labor forces, the compressed-air workers did not possess an irreplaceable skill they could leverage for bargaining power. Basically, the men exchanged dangerous, back-breaking labor for a daily wage. Like any common laborers, the bulk of their work involved moving earth. Some among them did marginally skilled work wiring lights, running pipe, or erecting iron. But none of this was so specialized that they could not readily be replaced from the ranks of unemployed waiting around the city. For this reason, the tunnel contractors categorized compressed-air workers as unskilled labor. The New York Times, Herald, and World agreed. From their perspective, the compressed-air workers were easily replaced. When laborers mounted a strike, inexperienced workers quickly lined up to take their places.

Regardless of what the contractors and press believed, the compressed-air workers considered themselves skilled. Common laborers offered capitalists more than muscle power loosely controlled. Laborers made decisions, functioned as teams, and used simple tools such as planes, pulleys, and levers. Compressed-air laborers added more value to the tunnel-works than just physical labor. Briefly considering the hazards of their work—the blowouts, the bends, and the curious qualities of work in compressed air (where an unlit candle can spontaneously relight)—makes clear the advantage in hiring experienced compressed-air laborers. The wages they received certainly distinguished them from other laborers. When the newly formed International Hod Carriers suggested that compressed-air workers might fall under their jurisdiction, the compressed-air workers “laughed at the idea of a Laborers’ organization trying to control the Compressed Air Workers.”

Part of the confusion stemmed from the various jobs compressed-air workers handled in the tunnel. Heading men worked in the shield at the front of the tunnel, pushing the tunnel forward, erecting iron, and shoveling silt. Muckers ran carts to and from the heading, removing full carts to an airlock where other laborers could empty them outside the tunnel. Semi-skilled workers doing basic pipe and electrical work may or may not have been included in the compressed-air workers’ union. The union’s charter aimed to include all men working in compressed air, but it is difficult to determine if semi-skilled men included themselves among this

40. Roy Rosenzweig, Eight Hours for What We Will (Cambridge, 1983), 24.
42. The importance of the lock-tender is explained in Smith, The Effects of High Atmospheric Pressure, 52.
44. Montgomery, The Fall of the House of Labor, 60-64.
Ultimately, in the 1940s and 1950s, it became clear that the bonds among compressed-air workers outweighed individual trades but it is doubtful this was the case in 1904. What was clear in 1904, when underwater tunneling works boomed around Manhattan, was that most compressed-air workers remained non-union. Diversity, immigration pressure, and turnover on the job all weakened the union’s presence. The union’s tentative existence, however, suggested that despite these difficulties, some compressed-air workers did identify with the work and considered themselves skilled.

Despite the tentative status of the Compressed Air Workers, national labor federations courted the union in 1904. This was a period of significant growth for national labor organizations such as the American Federation of Labor and the more radical Industrial Workers of the World. Between 1897 and 1904, national union membership had quadrupled to over two million. In this atmosphere, the AFL was willing to compromise its strong, trades-oriented politics to include workers of lesser skills. Herman Robinson, the AFL organizer in New York City, reported to Washington that "there appeared to be a desire on the part of the opponents of the American Federation of Labor to have [the Compressed Air Workers Union] become affiliated with the A.L.U." Robinson made a secretive appearance before the Compressed Air Workers and convinced them to apply for an AFL charter instead. Membership stood at 1,100 men. Before the AFL granted the charter, Robinson had to convince the AFL that the compressed-air workers differed from common laborers. To substantiate his claim, he wrote, "Their work ceases when the compressed air that is used is finished; then the laborers as well as the mechanics’ work begins." The spatio-temporal constraints of tunneling technology created a boundary, dividing common laborer from compressed-air laborer. The AFL granted the charter in 1904.

In reality, the AFL charter meant little to the compressed-air workers. Half the Manhattan tunnel projects had some union representation, but none were closed shops. Most contractors did not recognize the union, nor did most compressed-air workers. And to New York City's residents, tunnel laborers remained invisible entities in 1904. If newspapers mentioned tunnel labor, it was not distinguished from any other form of labor. Technology and medicine had helped distinguish compressed-air workers from other laboring groups, but to people who did not work in the tunnels, there was little reason to recognize the compressed-air workers as unique at the turn of the century. Only when tunnel construction around New York began in earnest, and accidents began to plague the works, did the compressed-air workers begin to attract the city's attention. Until then, compressed-air workers wielded little bargaining power, and remained largely at the mercy of the contractors for their safety and wages.

Though the British shield method of tunneling and the medical airlock had improved tunnel safety in the 1890s, the tunnels remained a forbidding workplace, and it is important to ask why the compressed-air workers exposed themselves to the tunnels' danger. After a day's shift, few men left the work entirely behind. The lingering effects of compressed air frequently caused joints to tighten and the body to ache, even while laborers were away from the job. But compressed-air workers knew they were receiving good wages for the work. In 1906, a week's labor in the tunnel paid up to $19.50. For a recent immigrant, these wages were incomparable. Other men working for unskilled wages in brickwork, shipbuilding, and street construction earned $10.48, $9.17, and $11.17 respectively. Unlike most laborers, who frequently lived as near as possible to their job to save money, the compressed-air workers lived all over the metropolitan area. More than one died from the bends as he boarded an elevated train or rode home on a ferry. For these risks, the compressed-air workers could be con-

46. Charter Record for the Compressed Air Worker Union. AFL-CIO Organizing Files.  
fident they received higher wages than most other immigrants they passed on the way home.

Compressed-air wages provided well for a single man. Rent in the tenement houses in Manhattan varied dramatically depending on the location of the building and the apartment within the building. In 1900, for instance, a three-room apartment could be let for $8.00 to $10.00 per month. This rent could be divided among several laborers, though some chose to live in boarding-houses instead. For those who cooked for themselves, sixteen eggs or three tins of imported sardines could be purchased for 25¢ and a dozen pints of beer could be purchased for $1.50. Furnishings, such as a gas-stove, could be acquired for $4.40 and a box couch for $8.75. Considering daily wages of up to $3.25, compressed-air workers wielded ample buying power. An additional incentive was that the tunnel projects were multi-year jobs that could provide an industrious laborer with a steady source of income, if he could stand the work. Compared to a longshoreman, who worked only a few days a week, this was job security.49

High wages and regular hours also made it likely that compressed-air workers enjoyed more leisure time than most laborers. Much of this time was probably spent in the local saloon. Saloons were part of the social fabric of immigrant life, helping to consolidate ethnic identities, working relationships, and friendships. Roy Rosenzweig, a social historian of American labor, suggests the rise of the saloon was not indicative of any social pathology among the common laborer, rather it suggested a measure of prosperity. Drinking was more than a past-time for urban laborers: many believed that alcohol helped them work harder. Common lore also suggested that alcohol strengthened them against the ill effects of extreme temperature shifts and diseases, including caisson disease. Thus, while tunnel doctors worked to provide compressed-air workers with medical relief from caisson disease, the men ministered to their own needs with 5¢ drafts and 10¢ shots of whisky.50 Many articles on tunnel disasters mention the fortunate worker who was let off from work that particular day for being hung-over or still intoxicated.

Alcohol was not the only reason the sandhogs spent their off-hours in the saloon. For many of them, the relaxed environment of the neighborhood saloon was preferable to the noisy and overcrowded conditions of the tenements. Saloons were unique in working-class life because they had no expectations: as long as a man had money enough for a drink, he was free to pass the time. A regular could depend on the saloon-keeper to receive his mail or provide him with nominal banking services. Considering the near ubiquity of the saloon at the turn of the century, it seems likely these establishments served as the primary social outlet for most compressed-air workers, though other attractions—professional baseball, legalized boxing, prize-fighting, and recreation establishments such as Brighton Beach Park and Coney Island—also attracted a growing working-class.51

The steady work and high wages did present one particular problem to compressed-air workers trying to protect their jobs. The large number of immigrants frequently arriving in New York City made it clear that a ready group of laborers waited to take their place on a tunnel’s work-gang. Odds are, they themselves had once numbered among those unemployed immigrants. Most immigrants who landed in New York, however, left the city to take jobs in construction, on the railroads, or in the mines. Most of these men would prefer to stay on in the city to work, especially at the wages compressed-air workers received. Contractors regularly warned compressed-air workers during labor disputes that “scores upon scores” of immigrants waited for their jobs.52 For the compressed-air worker, not only was day-to-day labor in the tunnel dangerous, but outside the tunnel the constant flow of immigrants into the city

50. Rosenzweig, Eight Hours for What We Will, 46; William J. Sonnenstuhl, Working Sober: The Transformation of an Occupational Drinking Culture (New York, 1996), 40;
made it clear that their long-term position in the tunnels was a tenuous prospect as well.

For the compressed-air workers who aimed to enjoy life, their generous wages afforded them many opportunities to explore the city. For other laborers, who were in America only to make money and then return through the revolving door to their homeland, the wages alone justified the trip to the United States. In the face of the tunnels’ dangers, the measure of prosperity that most compressed-air workers enjoyed helps explain why many of these men simply did not walk away from the tunnels and look for other work. Unlike most laborers in New York City, the compressed-air workers already worked limited hours for high wages and had leisure time to enjoy the expanding opportunities that New York City offered the working-class at the start of the twentieth century.

In 1904 and 1905, New York newspapers and magazines frequently reported on the New York tunnel projects. Excitement over the work of the Hudson and Manhattan Railroad, Pennsylvania Railroad, and the IRT was apparent. Most of these articles focused on the schematics of tunnel locations, contractors, and potential interchanges; the laborers received little attention. Nine tunnels were under construction or in the final stages of planning. The Hudson and Manhattan was building three tunnels: a second to parallel the first completed in 1904 and another pair farther uptown. The Pennsylvania Railroad Company started one pair under the Hudson and four more beneath the East River. And at the tip of Manhattan, the IRT commissioned its own pair of tunnels direct to Brooklyn. Though there were only nine separate tunnels, construction frequently progressed from either river bank simultaneously, thereby doubling the number of shields, the number of compressed-air workers, and the risk.

In March 1905, Richard Creedon, a compressed-air worker, captured New York’s attention. Creedon had been working with three other men beneath the East River. When a weak spot in the tunnel began to give way, Creedon hurried to stuff sandbags and straw into the breach before it was too late. But he got too close to the hole, and when it widened, and then suddenly gave way to a blow-out, he was sucked up through the silt and river “like a pea through a putty blower.” The New York Herald exclaimed, “Out of the middle of the river suddenly leaped a waterspout, bubbling and hissing to a height of twenty feet or more and with a roar heard for blocks. On the very top of this like the little ball borne up by the foundations in shooting galleries, lay Creedon, his arms and legs frantically flourishing in the air.” When rescuers in a nearby boat pulled Creedon aboard, the slightly startled compressed-air worker said, “Before I comes down I had a fine view of the city.”

Despite Creedon’s adventure, none of the criticism that slowed Haskin’s work thirty years before marked the public’s attitude toward this particular accident or the new bores spreading out beneath the harbor. While the laborers working beneath the rivers still received little recognition, there had been few accidents of this sort to draw the attention of city dwellers. Since 1903, thanks to British technology, no one had died on any Hudson River tunnel from caisson disease or in blow-outs.

Soon, however, the light-hearted, somewhat comic tone that characterized newspaper accounts of Creedon’s accident gave way to seriousness. Reports of compressed-air workers injured in blow-outs and stricken with caisson disease became more frequent in 1906. The reason for increased blow-outs was the difficulty of tunnel construction on the Pennsylvania Railroad’s East River tunnels. Mastering construction under the Hudson had been difficult enough, considering the semi-fluid state of the silt. But the East River did not have the same large watershed that endowed the western half of the harbor with a thick blanket of silt. The East River’s silt was mixed with sand, stones, and girded by large reefs of rock. Weak spots, where the river-bottom shifted between silt and rock, complicated more ambitious construction. In fact, potential contractors believed the work so complex that none would

53. Considering the significant numbers of Southern and Eastern Europeans on the job, it is likely some men intended to return to Europe after saving money. Between 1908 and 1910, forty-four men left for every hundred who arrived. See Gutman, “Work, Culture, and Society in Industrializing America, 1815–1919,” 554.


offer the Pennsylvania Railroad a fixed bid. S. Pearson & Co., the British firm that attempted to complete Haskin’s Hudson tunnels in the 1890s, eventually negotiated an unconventional percentage-based contract with the railroad.56

In 1906, as tunnel accidents began to occur more frequently under the East River, the public’s attitude towards the tunnel works began to change. Not surprisingly, the tunnels began to attract the attention of newspapers and Progressive reformers.57 At the start of the twentieth century, industrial reformers already advocated safer, more efficient factories, and better treatment of workers. Reformers even introduced a work-man’s compensation bill in the New York State legislature in 1898. Most of the movement’s energy centered on catastrophic accidents in mines or steel mills in the hinterland and the unfortunate conditions in nearby factories. Unlike those tragedies, which usually took place out of eyesight, tunnel blow-outs commanded all of New York’s attention: “Passengers . . . were treated to the sight of boiling geysers from tunnel blowouts yesterday. . . . Small boats coming within the influence of the spouting water were harried about as though caught in a maelstrom and thrown to one side with great force. Ferry boats steered clear of it.”58 New York City could hardly ignore the dangers that compressed-air workers faced beneath the harbor. Increased attention from the newspapers helped focus public attention on the compressed-air worker. Before long, this increased attention began to raise the compressed-air workers’ profile and helped create a public identity for the twentieth-century compressed-air worker. This marked the emergence of the “sandhog.”

The pivotal moment for the compressed-air workers came in the summer of 1906. Unsafe working conditions and numerous deaths from caisson disease on the Pennsylvania Railroad’s East River job had been rumored in the spring of that year. In early June, a series of newspaper articles presented horror stories of dead compressed-air workers being removed from the tunnels in the dark of night to avoid police and public attention. Each time a blow-out occurred, no matter how minor, newspapers now picked up the story. Soon, New York City coroner Schrady announced that he was initiating an inquiry into the working-conditions on the Pennsylvania Railroad’s East River tunnels. He explained:

It is recognized that the tunnel work is part of a great system of public improvements, and all classes of citizens welcome the entry of the road in Manhattan and Long Island. But we deplore the many and seemingly needless deaths which have been reported upon this job, a death rate far in excess of the rate on all other similar works in the city, and demand that the workmen be properly safeguarded.59

While tunnel construction had been progressing on three other major jobs, only the Pennsylvania Railroad’s works on the East River, managed by S. Pearson & Co., suffered such a high death rate. Affidavits alleged that over fifty men had died in accidents and from caisson disease since work began, a rate matched only by Haskin’s ill-fated tunneling works thirty years before. Schrady aimed to determine the “causes conspiring to produce such a large and unprecedented death record. . . .”60

Coroner Schrady’s investigation and the accompanying newspaper coverage elevated the workers’ public profile. Schrady highlighted the hazards of working in the tunnels and portrayed the men as brave workers, struggling against dangerous conditions and an unjust company to tie together the metropolis’s new transportation system. These were heroic qualities that New York City would soon associate with the “sandhog.” Schrady accused the contractor of neglecting to provide proper protection for the compressed-air workers. In their defense, the contractors attempted to fix blame on the compressed-air workers, claiming that the recent immigrants

working in the tunnels were weak and susceptible to ailments just like caisson disease.\textsuperscript{61}

Henry Japp, the construction manager for S. Pearson & Co., attempted to redirect blame in just this way, as a summary of his testimony in the \textit{Evening Post} suggests: "The deaths of the men in his tunnel . . . were largely due to [the compressed-air workers'] habits and dietary methods; the workers, as a rule, are of the lower classes, according to the witness, and are so unfitted to properly care for themselves that the tunnel company, in a measure, now provides for their sustenance in working hours."\textsuperscript{62} Japp appealed to early twentieth-century prejudices against immigrant laborers. The tactic was the same as that employed thirty years earlier when Haskin's superintendent blamed laborers for blow-outs on the original Hudson tunnels.

Japp's efforts did not succeed. Knowledge of caisson disease had increased dramatically by the start of the twentieth century. Increased use of compressed-air construction and the rise of physiology as a scientific discipline helped make caisson disease an area of intense study in Europe. In compressed air, the worker's blood absorbed more gaseous oxygen and nitrogen as he breathed. Upon leaving compressed air, if the pressure decreased slowly enough, the laborer exhaled these extra gases gradually as they were liberated from the blood stream. But if the transition was too quick, the effect was much the same as opening a champagne bottle: the gases came out of solution in an effervescent rush. In the human body this causes air embolisms that can disrupt the blood stream in the extremities or interior organs, leading to paresis or paralysis. The nineteenth-century American doctors such as Jaminet and Smith had rejected these physiological explanations pioneered by French scientist Paul Bert, but by the start of the twentieth century, physiology had become a mainstay in American medicine, and American doctors' understanding of caisson disease was changing. These changes helped make it clear that the contractors, such as S. Pearson & Co., were in fact responsible for preventing caisson disease.\textsuperscript{63}

\textit{Scientific American} published an article championing this new physiological understanding of caisson disease in 1904. The article introduced new research by British physiologist Dr. Leonard Hill, which confirmed Bert's physiological explanation of the disease, and dismissed Smith's earlier Newtonian understandings of the disease developed during construction of the Brooklyn Bridge. Hill's work made it clear that the rate of decompression, and not idiosyncratic qualities, was the critical factor in caisson disease. Doctor Smith had understood the importance of decompression in preventing the bends, but he had recommended five minutes for decompression, while Hill recommended from half an hour to an hour. The article captured the tension between earlier American ideas of caisson disease and the stronger European physiological ideas of gas saturation. The largely speculative American explanations, that included decompression but also emphasized idiosyncratic qualities such as facial hair, nutritious diet, tidy barracks, and rubber boots, were giving way to the rigors of medical science.\textsuperscript{64}

When Coroner Schrady entered into his final argument, he made it clear whom he blamed for caisson disease: "Experts agree that cases of the 'bends' are preventable. You must remember that, according to the testimony before you, there have been no deaths from the disease in the [Hudson River] tunnel since 1903. You must fix responsibility, if responsibility there be for the deaths of these tunnel victims and you must be solely guided by the evidence before you." In late June, the coroner's jury returned a strong indictment of S. Pearson & Co. and the Pennsylvania Railroad.

61. For prejudices against immigrants as laborers, see Montgomery, \textit{The Fall of the House of Labor}, 75, 81.
64. "Caisson disease," \textit{Scientific American}, Feb. 2, 1904, p. 23523. \textit{Scientific American} actually reprinted this article from the \textit{New York Tribune}, which further suggests the attention given to caisson disease. While Hill moved away from the typology of Smith and Jaminet, he did recommend that the best men for the work were "twenty or twenty-five years of age, tough and wiry in their build and asthenous in their habits." These ideas, however, were based on physiological evidence that animal fat absorbed more gas, and therefore made heavy men more susceptible to caisson disease. For Hill's research see Leonard E. Hill and J. R. Macleod, "The influence of compressed air and oxygen on the gases of the blood," \textit{Journal of Physiology} 29 (1903), 382–87; Hill, "The influence of atmospheric pressure on man," \textit{Lancet} 2 (1905), 1–4.
The jury held the companies responsible for all of the coroner's original charges. They were ordered to reinstate the lock-tenders, properly regulate the amount of time taken to exit the airlocks, ensure that all men in the tunnel were physically fit, and provide a clean supply of air. Furthermore, the jury recommended that the Board of Health monitor S. Pearson & Co.'s works to be sure "proper and necessary action [is taken] to prevent any further needless loss of life." The coroner's inquest had been an investigation of the rights of compressed-air workers and of the responsibility for caisson disease. The jury's verdict made it clear that the contractor was responsible for keeping the men safe.

Ironically, the same day that the jury issued its verdict, another serious blow-out occurred on the PRR's East River tunnels. The World reported that the foreman "rallied some of his crew instantly and made heroic efforts to rescue the entrapped men below and to stop the break." Despite their efforts, two men died. Unlike Creedon, who had been sucked straight out of the river in his blow-out, these men got stuck in the mud and drowned. What distinguished the coverage of this accident was how the compressed-air workers were identified. Throughout the coroner's investigation, reporters found various names for the compressed-air workers—"groundhogs" or "sand-diggers" among others—but by the end of the trial, "sandhogs" emerged as the standard nickname for compressed-air workers.

The name stuck. And over the next month, it received frequent use. Despite the censure that the contractors received from the jury, they made no quick moves to improve conditions in the tunnels. Sandhogs continued to die in blow-outs and from caisson disease over the next few weeks. Now, however, the newspapers covered the sandhogs and the tunnels more intensely than ever before. The World, for instance, complained that no lock-tenders had come on duty, the same quality of air was pumped in, and sanitary conditions in the tunnel were inexcusable. On June 27, the four-hundred sandhogs working on the PRR's East River tunnels went on strike.

They demanded shorter hours, more pay, and compliance with the coroner's jury. As far as the workers were concerned, "a dollar an hour was little enough for a man who worked under such conditions and was in danger of losing his life any minute." Instead of picketing the job, the men counted on the frequent newspaper articles reporting the dangers of blow-outs and the bends to scare off any unemployed immigrants who might consider applying for their jobs:

When the men struck they argued that it would be impossible to induce green men to face the terrors of the 'bends,' blowouts, falling rocks, and lifelong paralysis. But they misjudged, for a veritable army of the unemployed announced themselves willing to brave any danger for the $3.25 and $3 a day, which represent princely wages to the horde of immigrants pouring into the city through Ellis Island.

When the sandhogs first went on strike, the tunnel superintendents made arrangements to transport immigrants directly from Ellis Island to the job site. Such contingency plans were unnecessary. A large number of Polish men lined up at the doctor's office the next morning, each willing to work as soon as he received clearance. Once again, unemployed immigrants compromised the sandhogs' ability to mount a successful strike. With the Polish immigrants lined up to replace them, the sandhogs "threw up the strike" they had started only forty-eight hours before and returned to work. The Herald observed that, "they were beaten badly and they knew it." The strike did win one concession from the contractors: S. Pearson & Co. promised to reinstate lock-tenders in the upper locks, from which they had been removed the month before for the sake of economy. The sandhogs, however, surrendered their demand for shorter hours and better pay. They had been asking to work for two hours less per day with 25 cents more pay.

Amidst the confusion of June 1906, the Compressed Air Workers Union realized few immediate gains, as their unsuccessful strike

suggested. More important, however, was the enhanced profile of compressed-air workers, who had achieved a measure of stardom around New York City. By the middle of the month, any New Yorker who regularly read the newspapers or traveled the ferry boats to lower Manhattan, would have heard of the sandhogs working beneath the harbor. The compressed-air laborers had been transformed into “sandhogs” by the coroner, the reformers, and most importantly, by the New York newspapers. The new identity represented the confluence of forty years of tunneling technology and medical knowledge, Progressive ideals, urban infrastructure expansion, and immigrant demography.

When newspapers across New York City described the raucous party of sandhogs and tunnel engineers at Sherry’s restaurant in March 1907, the newspapers were celebrating the bravery of these laborers who struggled beneath the harbor to link Manhattan to the mainland. As one New York reporter explained, the sandhog “has changed the shape of Manhattan, robbed it of its insularity as it were, and brought the Long Island cities physically as well as politically into the fold of the metropolis.” Such praise for a group of laborers, mainly recent immigrants from Southern and Eastern Europe, was rare at the start of the twentieth century. This praise marked a change from 1905, when Creedon worked frantically beneath the East River, desperately trying to stop the blow-out. At the time, he was part of a group of undistinguished laborers, insignificant to the metropolis above. Minutes later, after he had been rocketed from his work, he emerged atop that geyser a hero. His adventure marked the beginning of public recognition for the compressed-air workers. Where compressed-air workers had previously been depicted as unhealthy immigrants who were likely to suffer from ailments such as caisson disease because of their own short-

71. For a different account of the 1906 strike, see Paul E. Delaney, Sandhogs (New York, 1983). This popular history of the sandhogs, commissioned by the Compressed Air Workers Union, celebrated the strike of June 1906 as the beginning of cross-trade labor cooperation in the tunnels. My research suggests that the United Tunnel Workers organization existed temporarily and did not mark the start of the sandhog’s union.

comings, this new image of the sandhog celebrated their bravery and resilience.

Publicly recognized identities are rare among laboring groups. If many historical factors had not converged in the summer of 1906, sandhogs would probably have remained one among many undistinguished laboring groups building the growing metropolis. The formation of the sandhog identity, however, emerged from the intersection of many historical forces. The working environment of the sandhog, shaped by nineteenth-century tunneling technology and medical knowledge, helped distinguish compressed-air workers spatially and temporally from other laborers on the tunnel jobs and around New York City. At the start of the twentieth century, the rapid expansion of the city’s infrastructure, the complex geological structure of the East River, the attention of Progressive reformers and the city’s newspapers all helped elevate the profile of the compressed-air worker. These factors endowed compressed-air workers with an identity that was recognized outside the tunnel works and provided them with bargaining power that was rooted in public attention. Over the following decades, this public profile helped sandhogs strengthen their union and their bargaining power.

In 1909 and 1911 when the Compressed Air Workers Union raised standard wages, the New York Times reported the new official wages for compressed-air workers. The paper noted that “the 1,300 workmen in this dangerous business” would receive approved wages ranging from $3.50 to $4.50 a day, for work in pressures of 22 to 45 pounds per square inch. Based on this scale, the sandhogs who struggled against S. Pearson & Co. on the PRR’s East River tunnels, would have received up to a dollar more for two hours less work each day. In the three years since sandhogs received public recognition, they had already made significant progress in achieving better pay for their work.

In the following decade, sandhog jobs spread to surrounding states as compressed-air work became more common. By 1915,
hogs' identity eventually culminated in the union's lobbying efforts for a new water tunnel from the Catskills to the New York metropolitan region in the 1970s. When City Tunnel No. 3 began, it was the largest public works project in the city's history, and promised sandhogs steady work into the twenty-first century. 75


William Cullen Bryant stood among the greatest of the great in the literary world of nineteenth-century New York, but he was especially notable because his accomplishments were not confined to literature. A poet of world-wide renown, he was also a lawyer, journalist, reformer, and linguist—translator of poetry in five modern languages and of Homer’s Iliad and Odyssey. The very variety of his accomplishments complicates the task of those who assess his place in history. His contemporaries and present-day students of his life and work reveal varying, sometimes contradictory, perceptions of his work and, strange to say, even of such mundane matters as his appearance. The matter of perception is no less elemental in historiography than in trials by jury and other formal efforts to determine an objective truth. Bryant is a notably interesting subject for the exploration of questions relating to perception and reality.

What, for example, may we make of the conflicting images of Bryant reflected in the writings of his two younger contemporaries James Russell Lowell and Edgar Allan Poe? In A Fable for Critics (1847), Lowell saw him as a “smooth, silent iceberg” standing in “supreme ice-olation.” Yet at nearly the same time Poe...